

# ISUF2021

G L A S G O W

## Annual Conference Proceedings

of the

## XXVIII International Seminar on Urban Form

“Urban Form and the Sustainable and Prosperous City”

29<sup>th</sup> June - 03<sup>rd</sup> July 2021 - Glasgow, UK

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## Foreword

Dear Authors, esteemed Readers,

It is with deep satisfaction that we write this Foreword to the Annual Proceedings of the XXVIII International Seminar on Urban Form held virtually in Glasgow, United Kingdom, between June 29th and July 3rd 2021.

When, at the closing of ISUF2019, the Urban Design Studies Unit at the University of Strathclyde in Glasgow (UK) was announced as the host of the XXVIII International Seminar on Urban Form, the world was indeed very different from what, in just few months, we all came to know, and in ways which, at the time, we could not possibly imagine.

Due to the protracted impact of the Covid-19 pandemic and related restrictions to travel and in-person gathering, we found ourselves to forfeit our plan to host the conference in our beautiful and welcoming Glasgow and, very much like our colleagues in Salt Lake City, to deliver the event as fully online instead. We were truly sorry not to be able share a dram of Single Malt Scotch Whisky, have you taste Scottish haggis neeps and tatties, or take you for a spin at an evening Ceilidh in our Dear Green Place. In addition to this, just few days before the opening of ISUF2021, we were shocked and saddened by the unexpected loss of Emeritus Professor Jeremy Whitehand, founding father of ISUF, leading scholar, inspiring educator, and dear friend to many.

But despite the odds being stuck against us, and while our community is still mourning this great loss, we believe we achieved the feat of delivering a thought-provoking and engaging event, continuing the long and prestigious tradition of the International Seminar on Urban Form, while also doing our best to remember and honour Professor Whitehand as he deserved.

A difficult goal, this one, that we could achieve only thanks to the valuable experience of our colleagues in Salt Lake City, the involvement of a formidable team of colleagues and students who volunteered their time to help through all the phases of this complex event and the guidance of the ISUF Council and, to Jeremy himself who, with his meticulous and impeccable planning, granted all of us a once in a lifetime opportunity to have him at ISUF2021 after all and in many different forms, through the voices of his fellow scholars and, quite extraordinarily, through his own recorded voice.

We were able to reach a wide audience of over 370 delegates presenting and attending from some 52 countries around the world, allowing us to bring urban morphology and its values to new colleagues and friends, as well as to audiences that would not have been able to join us in Glasgow, or that would normally not consider attending a conference. We held a total of 95 sessions - including keynotes, round tables, opening and closing sessions - each moderated by a chair and supported by a host, for over 230 hours of live content. All the sessions were also recorded and made available to conference delegates for a period of 60 days after the conference, allowing people attending from different time-zones to listen to each and every one of them at their own pace. Surely, we missed informal gatherings, tours, meals, and parties but we did our best to give all delegates the best of the Scottish hospitality, through virtual walking tours prepared and delivered by current and former students of the Department of Architecture at the University of Strathclyde and lectures delivered by representatives of the Glasgow City Heritage Trust.

And now, after little over six months from the end of ISUF2021, we are finally able to release to the public the Annual Conference Proceedings of the XXVIII International Seminar on Urban Form: "Urban Form and The Sustainable and Prosperous City" a work curated by Dr Alessandra Feliciotti and Dr Martin Fleischmann. The contributions collated in this edited book illustrate the great variety of research streams investigated within ISUF and represent the heterogeneous geographical distribution of contributions, both telling aspects of this florid and growing interdisciplinary field, characterised by deep solid roots as well as vigorous far-reaching branches.

We believe these Proceedings will provide urban form researchers and practitioners of the world with an excellent reference book on the latest advances in the broad area of urban morphology, stimulate new connections and research partnerships, and be an impetus for further research.

We thank all authors and participants for their contributions.

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Conference Organiser of ISUF2021

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## Preface by ISUF2021 chair

The 28th ISUF Conference was organised by the Urban design Studies Unit at the Department of Architecture of the University of Strathclyde in Glasgow, from the 29 of June to the 3rd of July 2021. The weather was excellent in Glasgow in those days, with a daytime high of around 20 degrees Celsius and no rain throughout. Too bad we could not enjoy it, for all the good reasons that travelling had been a question mark all year round and despite all our commitment we just could not take any other decision than going fully online. Which we did, and it was a dizzy jump into the unknown for us all. Things got sorted out, eventually, and in style, thanks to Alessandra and Martin and all our incredible folks here at UDSU, the Department of Architecture and the University at large, ISUF's support and the enthusiastic contributions of splendid guests who committed themselves to enrich the environment of the conference – though virtually – with invaluable and unreplaceable insights of the real place.

We decided to focus on “Urban Form and the Sustainable Prosperous City”. The more we study cities, the more we realise that their form is never neutral. On the contrary, space is active: how it interacts with social, economic, environmental and economic systems, is central to their success. On urban form also depends cities' capacity to be and remain successful and engaging in time. Form is central across all scales of urban systems and we are at a stage in which our capacity to study social, economic and environmental systems can be related to the analysis of urban form like never before. Furthermore, new technologies, as well as new interpretative frameworks that put time and resilience at the heart of cities' life, have grown in clarity and capacity over the past years, helping immensely our understandings of these complexities.

Theories, methods and practices in the study of urban form were explored in the conference, with two special focuses proposed: “The resilient city: ecological perspectives in Urban Morphology” and “Urban Morphology for SDG 11”. Sustainability and resilience are terms often used interchangeably, while they can be regarded as complementary in capturing both normative and descriptive aspects of change. As associated to urban form, these terms are still open avenues of research as well as promising areas of growth in the ability of urban morphology to further inform urban policy and practice.

Urban morphology is an inherently multi-disciplinary field of research, and each of its many convergent strands of knowledge brings its own set of tools and practices. To the foundational backbone of the discipline, still solidly developing around the Conzenian and Muratorian historico-geographical and morpho-typological living traditions, as well as to the more recent space-syntax quantitative-configurational approach, new impulses have been shaping up in the last few years that have conspicuously marked their presence in this 28th edition of the ISUF conference: these are quantitative approaches building on geographic data science, which rely on advanced techniques of data processing to push the boundaries of large-scale analysis to unprecedented levels, and – even more importantly – without compromising the richness of information. Which is fundamental: urban morphology's core-scale, that of the building/plot, street and neighbourhood, requires information at that scale. That is why other quantitative methods that look at the form of the city as a whole, or beyond to the metropolitan or regional forms of urbanisation, have always struggled to fit in, and contribute to, the development of urban morphology. The unprecedented flood of papers in this area of studies characterized the event. They also seemed to seamlessly and even delicately find their own place and meaning in the rich flow of the urban morphology discourse, building on – and making value of – its quantitative side. In fact, “metrology” studies of urban form have always been part of the discipline since its very foundations in the 1960s. This was also the focus of Jeremy's own contribution to the round table at the conference, entitled “Urban Morphometrics in Urban Morphology: Disciplinary Roots and New Perspectives”, where he explored these roots drawing them back to the inter-war period and Herbert Louis' precursory studies at the Geographical Institute in Berlin. A young geography student at that time in Berlin, MRG Conzen was there in attendance before leaving to Britain in 1933. This red thread of urban morphology metrology studies is now quite clearly evolving into novel “morphometric”

methods of reading and understanding urban form, under the impetus of new technologies, processes and large-scale, fine-grained geo-data.

Jeremy would have liked to bring this point of view in person to the round table, with his usual crystalline open mindedness and genuine generosity. We'll miss him dearly.

Prof Sergio Porta

Chair of ISUF2021

Urban Design Studies Unit (UDSU)

Department of Architecture

University of Strathclyde

## Preface by ISUF Presidents

Over the last three decades, since ISUF's first meeting in Lausanne in 1994, our knowledge about the physical form of cities has substantially increased. Today, we know more about the different elements of urban form, how these are combined generating different patterns, and how these are shaped by different agents and processes over time. We also have a better understanding of urban form's influence on the social, economic, and environmental dimensions of our cities. Multiple concepts and methods as developed by founding scholars such as M. R. G. Conzen, Jeremy Whitehand, Saverio Muratori and Gianfranco Caniggia have proven to be quite effective in describing and explaining urban form, resulting in their widespread adaptation by urban morphologists today. Examples of these foundational tools for urban studies include town-plan analysis, fringe belts, morphological regions, typological processes, basic and special buildings, poles and nodes, to name just a few. Findings surrounding applications of morphological existing methods coupled with new tools for urban analysis continue to evolve further enriching our interpretations of urban environments. We realize how street systems can influence movement, social interaction, and the location of economic activities. We use new geometries and new mathematical models where agents have a key role and where the different elements of the urban landscape can be transformed into cells, enabling the simulation of alternative scenarios of development.

While the early years of an organization are challenging by nature, for ISUF the last five years brought unprecedented challenges. The organization of our annual conferences was first faced with significant political barriers in a world with so many authoritarian regimes. It is with great sadness and concern that we see Ukraine being invaded by Russian forces at the time of writing this Preface. On the other hand, since early 2020 the Covid-19 pandemic has completely changed our lives. And yet, between 2018 and 2020, Irina Kukina, Nadia Charalambous and Brenda Case Scheer have successfully overcome these tremendous challenges, offering us three enlightening conferences in Krasnoyarsk, Nicosia, and Salt Lake City (online conference). As the pandemic has continued to inhibit in person gatherings and international travel, the organizers of the Glasgow conference have exhibited resilience by offering ISUF's second fully online conference.

One day after the 2021 meeting of the ISUF Council, and two days before the official opening of the Glasgow conference, we were shocked to learn of Jeremy Whitehand's sudden passing. Until the last weeks before the conference, Jeremy was working with us on a Task Force on Teaching Urban Morphology, on two special sessions (on the relation between research and practice, and on quantification in urban morphology) and on a keynote speech for this conference entitled 'The nature of urban morphology' (Whitehand, 2021). Jeremy was central in the creation of ISUF in the mid-1990s, and he has always been at the centre of our organization over the last three decades. He organized two conferences – the first open event in Birmingham, in 1997, and the Newcastle / Glasgow conference, in 2004, together with Michael Barke. For over almost 25 years he has edited with singular rigor the journal 'Urban Morphology'. Jeremy's legacy (see Oliveira, 2019) will always be part of our organization and of our morphological research.

Two generations of notable and committed researchers based at the University of Strathclyde collaborated over the past two years to organize ISUF 2021. They include Sergio Porta, Alessandra Feliciotti, Ombretta Romice and Martin Fleischmann. This book of proceedings, as the conference itself, is framed by the on-going debate about the role of urban form in creating sustainable and prosperous cities. Sergio and his colleagues propose a fourfold structure for debate including four main themes that are fundamental for ISUF and for urban morphology as a field of knowledge. Theory and method are the first and second of this set. Urban morphologists should be able to establish an open, but coherent, body of theories and methods for understanding the structure and functioning of cities. In addressing these two challenges, we must find a common ground, allowing each one of us to learn from each other, while maintaining the specificity of his own work. The third theme is practice. We must continue to search for effective ways of moving from morphological research to practice in planning,



urban design, and architecture. In this task it is not enough for urban morphologists to simply assert their relevance and claim that they could play a part, if only they were asked (Barke, 2021). It is not enough to create single events of interaction; we must create effective processes, involving many moments for researchers to understand and engage into real practice, and for practitioners to be exposed to and get involved in research on streets, plots and buildings, and how these change over time. Finally, the Glasgow team proposes a focus on sustainability. Urban morphologists must be able to show the relevance of urban form to several key aspects of our daily life in cities, and in the design of strategies for adaptation and mitigation.

This book of proceedings is built from the participation of over 350 researchers from more than 50 countries, presenting their work in almost 100 sessions – including keynote, round tables, and opening and closing sessions – representing almost 250 hours of live contents. The publication of this book takes place in between the realization of the Glasgow (June/July 2021) and Lodz/Cracow (September 2022) conferences. We owe a debt of gratitude to Sergio, Alessandra, Ombretta and Martin for their remarkable work. The second conference, led by Anna Agata Kantarek and Malgorzata Hanzl, is expected to bring us back the possibility of meeting face-to-face to restore place-based collaboration, presenting our investigation, establishing and reinforcing research networks, and visiting and exploring the physical fabrics of cities – the privileged object of morphological inquiry.

Prof Vitor Oliveira

President of ISUF

Research Centre for Territory Transports and Environment (CITTA)

Division of Spatial and Environmental Planning

Department of Civil Engineering,

University of Porto

Prof Emerita Wendy McClure

Former president of ISUF

Architecture Program

College of Art and Architecture

University of Idaho

Barke, M. (2021) 'Foreword', in Oliveira, V. (ed.) *Morphological research in planning, urban design and architecture* (Springer, Cham) v-viii.

Oliveira, V. (ed.) (2019) *J.W.R. Whitehand and the historico-geographical approach to urban morphology*, Springer, Cham.

Whitehand, J. W. R. (2021) 'The nature of urban morphology' (prerecorded video), *28<sup>th</sup> International Seminar on Urban Form*, Glasgow, 29 June – 3 July.

## Organization of the Proceedings

The Annual Conference Proceedings of the XXVIII International Seminar on Urban Form: “Urban Form and The Sustainable and Prosperous City” collates 178 papers, and 3 posters and 1 viewpoint. In keeping with the structure implemented during submission, review and presentation of individual contributions, the present book is divided into four main sections: Theory, Methods, Practice and Focus. Within each section, papers were further grouped in a number of themes, as defined below.

Section I, **Theory**, contains contributions deepening our understanding of existing morphological and typo-morphological theories, models and concepts as well as exploring new avenues of knowledge and perspectives from affine disciplines, linking them up to established or original morphological theories. Themes in the theory section include:

- **The epistemology of Urban Morphology:** retracing the evolution of a discipline and charting new research paths.
- **Towards a descriptive science of urban form:** old and new models explaining generative and transformative processes driving complex trajectories of urban evolution.
- **New trans-disciplinary perspectives in urban morphology:** new hybridisations for a holistic understanding of complex city systems.

Section II, **Methods**, looks at existing and innovative tools and procedures for the reading and understanding of urban form and its dynamics, encompassing both qualitative and quantitative approaches. Within the Methods sections, contributions are divided into the following themes:

- **Innovations in qualitative research in Urban Morphology:** methodological perspectives linking to classic Conzenian and Muratorian traditions, with an emphasis on qualitative research methods.
- **Innovations in Urban Morphometrics:** perspectives bringing new quantitative methods into Urban Morphology building on the rise of the digital age, including digital cartography, big data and remote sensing.
- **Engaging with the social, cultural and institutional discourse:** novel and original research methods capturing the interaction of urban form and human life engaging with complementary disciplinary fields.

Section III, **Practice**, looks at urban form as an active player in shaping tomorrow’s cities and at the world of professional practice, policy and education. Contributions within this section address the following themes:

- **Urban Morphology for design, planning and policy:** the practical role of urban form towards the sustainable and resilient, safe and inclusive cities for all.
- **Urban Morphology, Architecture and Heritage:** preservation, reuse, valorisation of built heritage as asset for future prosperity.
- **Teaching Urban Morphology:** methods, experiences and lessons learned to shape the next generation of architects, planners, urban designers and policy makers.

Section IV, **Focus**, reflects on urban morphology in light of emergent global drivers and in relation to the wider debate on Sustainable Development and Climate Change. Contributions within this section revolve around two main topics:

- **The resilient city: ecological perspectives in Urban Morphology:** perspectives and approaches linking urban form to the overall resilience of urban systems.
- **Urban Morphology for SDG 11:** contributions relating urban form to sustainable development goal targets.

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Sergio Porta (Chair of ISUF2021), Alessandra Feliciotti (Principal Conference Organiser), Martin Fleischmann, Ombretta Romice

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**Organic growth as a process to reach a resilient and sustainable city**

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**Abstract**

*From the beginning of the year 2000, cities are in continuous development at an unprecedented speed, hosting every year larger populations. In this urban horizon of constant growth, cities play a crucial role in affecting or improving the living quality of human beings and the successful interaction among social, environmental and economic systems. As a living organism, the city acts as a complex system of shapes and functions able to evolve in time to stay alive. The term 'resilience' means the ability to resist or survive by changing those features of every organic system including the city. The resilience of urban form represents a method to guide the growth of contemporary cities, also included in the ninth and eleventh Sustainable Development Goals (SDGs) respectively. Nowadays, most towns are featured by uncontrolled urbanisation that seems not compatible with the natural city's inclination towards resilience and sustainability. These terms are often used interchangeably, while they are complementary. If associated with urban form, these terms are still unexplored avenues of research as well as a preliminary investigation. In particular, there is a gap in the field literature matching urban morphology, resilience and SDGs. This paper aims to reply to the following question: how can urban morphology actively enhance the city's adaptability and its sustainable processes of change? Merging the City Resilience Framework from the Rockefeller Foundation in cooperation with Arup and the Global Indicator Framework for the SDGs from the 2030 Agenda, it provides a theoretical and methodological contribution to translate them into urban fabrics and typologies, by hypothesising a set of new requisites enable to comply with resilience science and sustainable development. The research results will foster advancements in spatial morphology to further direct urban policy and practice towards a more organic approach to city evolution.*

**Keywords:** city as organism, urban morphology, resilience, SDGs.

**Introduction**

Urbanisation is one of the most important and unavoidable trends of the 20th and 21<sup>st</sup> centuries. From the beginning of the year 2000, cities are in continuous development at an unprecedented speed, hosting every year larger populations. Currently, 55% of 7.7 billion people live in urban areas, a rate that is expected to grow to 68% (9.7 billion) by 2050 due to a natural population increase and rural-urban migration motivated by the higher standard of living since cities account for 80% of total global GDP (UN DESA, 2019). Despite the urban footprint occupies only 2% of the Earth's land surface, rapidly rising populations forced an unprecedented urban expansion at all scales and forms. City-Regions and Megacities have developed anywhere in the world, but the largest cities are located in the Global South where the fastest urban growth is projected as medium-sized cities, especially in Asia and Africa, while the low fertility rates in Europe results in significant densification of the capital city centre and a decreasing population in suburbs (UN DESA, 2018). Accelerated urbanisation not only leads to new urban forms and definitions such as functional urban areas,



but it also brings related global challenges including poverty and unemployment, conflicts and inequalities. Continuous urban growth along with locked physical form and sprawl puts pressure on natural resources and affects land consumption. Being the main contributors to energy use and CO2 emissions, cities play a crucial role in tackling climate change while improving urban liveability.

As a living organism, the city acts as a complex system of shapes and functions able to evolve in time to stay alive. The term 'resilience' means the ability to resist or survive by changing those features of every organic system including the city. It constantly adapts its form to environmental, social, cultural and climatic needs. In this regard, the resilience of urban form represents a method to guide the growth of contemporary cities. Indeed, the issue of resilience occurs in the Sustainable Development Goals (SDGs) as well. However, uncontrolled urbanisation seems not compatible with the natural city's inclination towards resilience and sustainability. The larger and uneven a city becomes, the more the mutual balance between the inner parties weakens: this increases its vulnerability to change. Sustainability and resilience are terms often used interchangeably, while they are complementary. If associated with urban form, these terms still remained unexplored avenues of research as well as a preliminary investigation. In particular, there is a gap in the field literature in matching urban morphology, resilience and SDGs. We need to better explore urban patterns of change faster and more precisely and to understand the meaning of sustainable and resilient urban form. From this perspective, urban morphology holds a central role in the design and management of urban form. In line with the UN 2030 Agenda, this paper aims to investigate how urban morphology can actively contribute to the city's adaptability and its sustainable evolution. By merging and comparing the global drivers of resilience and sustainability (City Resilience Framework, SDGs), it provides a theoretical and methodological contribution to translate them into urban fabrics and typologies. It suggests a set of new requisites enable to comply with resilience science and sustainable development.

## **Background**

The 21st-century cities are complex systems whose infrastructural, economic and social components are strongly interrelated and whose physical dimension impacts everyday life (Jacobs, 1961). One of the toughest challenges Urban Morphology faces today is to describe contemporary cities, analysing their form and spatial processes from an ecological perspective. It is time for a science of how city growth affects the environment and society, just as an integrated, quantitative, predictive understanding of the growth dynamics of cities is urgently needed (Bettencourt and West, 2010). As a science of urban form, Urban Morphology has provided several theoretical advancements to explain city complexity or patterns of development, but they have been criticised for their anachronistic methods, inability to generalise and to be applied in practice for addressing environmental issues (Oliveira, 2021). Actually, Muratori proposed an ecological viewpoint in Urban Morphology as early as the '60s by defining territory as the joint action by man and nature as well as an environmental organism that is the stable heritage of civilisation (or space-time synthesis) in a variety of

sustainable settlement patterns (Lombardini, 2017). Thus, the Muratorian research came to an inevitable urban organicism. For him, the city is not only a living organism that is an individual in a conservative and historical sense, homogeneous in fabric and unitary in system, integral-integrative and inseparable from its natural environment, but it is also the result of an organic process of permanence and continuity; it proceeds in its cyclic evolutions through internal modifications of its components in structural meaning of space and functional meaning of time (Muratori, 1967). After a few years, Caniggia confirmed the same organic vision at the building scale: “urban organism comes from the typological process where interrelation between the parts, and between the parts and the whole by establishing more complex links of necessity and hierarchy” (Caniggia and Maffei, 1989: 62). Starting from the hypothesis of ‘city as organism’, as the XXII Isuf International Conference was titled, this study puts forward the concept of organism on which both the geographical perspective by Muratori and the architectural scale by Caniggia are based respectively, associating it with resilience and sustainability allow the city to preserve a dynamic equilibrium (Van Timmeren and Henriquez, 2013). Yet, there is a large overlap between the meaning of *urban resilience* and *urban sustainability* that the literature tried to make it clear via conceptual and empirical framework using research trends or scale and emphasising their mutual contribution to the city development: on one hand, urban resilience is the passive process of maintaining a virtual cycle between ecosystem services and human beings; on the other hand, urban sustainability is the active process of synergetic co-evolution between the urban subsystems without compromising human life and biosphere, now and in the future (Zhang and Li, 2018). Recent studies argue the increasing value of the relationship between resilience and sustainability in guiding urban planning, especially as resilience belongs to various research fields. Indeed, we can group it under three main conceptualisations: Engineering Resilience (ability to return to initial equilibrium after a disturbance); Ecological Resilience (ability to restore the internal functionality after a shock); Evolutionary Resilience (process of adaptation of an unstable system in permanent change) (Rega and Bonifazi, 2020). As an organism made nonlinear dynamics of natural and anthropogenic functions, cities include them all as they have considerable internal resilience within a certain domain of ecological stability (Holling, 1973). Hence, Urban Resilience is the capacity of cities to survive, adapt and grow throughout any stress they experience while protecting and enhancing people’s lives (JRC, 2019). Regarding the specific interrelation among spatial morphology, resilience science, and sustainable urban form, the research has taken its preliminary steps by merging some morphological aspects with resilience thinking, social equity and ecological systems. However, the related investigations underline the need to develop a new research frontier based on morphology for addressing urban design (Marcus and Colding, 2014). As to urban sustainability, we refer to the official notion and targets including in the UN 2030 Agenda for Sustainable Development Goals (UN, 2015). Nevertheless, some insights underline the complexity and difficulty to use such indicators as a tool for evaluating progress towards sustainable and inclusive urban areas, due to the unavailability of open and standardised datasets, not comparable urban scales in widely different cities, and over-generalisation coupled with lack of locally appropriate benchmarks (Klopp and Petretta, 2017; Thomas *et al.*, 2020). Although many applications in optimising urban form and socio-environmental quality by typological

performance, shape factors, energy analysis, and sets of urban morphology indicators (Morganti *et al.*, 2017; Natanian *et al.*, 2019), it is still unclear how morphology fits with the SDGs. This paper intends to bridge such a knowledge gap by updating the morphological thought with a mix of parameters of resilience and sustainability and fostering its advancement towards a more organic approach to city planning.

## **Methodology**

Through an integrated approach, we try to reply to the following research questions: What is the role of Urban Morphology in designing and managing future urban forms? How can Urban Morphology actively enhance the city's adaptability and its sustainable processes of change?

This study is carried out by comparing and integrating two conceptual frameworks for resilience and sustainability respectively: City Resilience Framework (CRF) and SDGs from the UN 2030 Agenda (Figure 1). Promoted by Arup in cooperation with the Rockefeller Foundation, the City Resilience Framework was launched in 2012 as a research project applied to 100 cities worldwide, including the Asian Cities Climate Change Resilience Network. It provides a lens to identify critical areas and actions for increasing their resilience in withstanding shocks and living better in good times. This framework is based on multiple drivers, 4 Dimensions (people, health and wellbeing; place, urban systems and services; organisation, economy and society; knowledge, leadership and strategy), 12 key goals or drivers (minimal human vulnerability, livelihoods and employment, safeguards to human life, community identity, comprehensive security, sustainable economy, reduced fragility, provision of critical services, mobility, effective management, empowered stakeholders, integrated development planning) which are elements of a city's immune system and complemented by 7 qualities (Flexibility, Redundancy, Robustness, Resourcefulness, Reflectiveness, Inclusiveness, Integration) that distinguish a resilient city from another simply liveable or prosperous. Its innovative approach lies in the awareness that every city is unique and the way resilience manifests itself plays out differently in different places, thus a global thought is translated into numerous local factors. Moreover, it is applicable to both disaster risk reduction and chronic stresses (OAP, 2014). The CRF was the first step to index the urban resilience in a preliminary list of variables: that is its main limitations. The UN 2030 Agenda was adopted by the Member States in 2015 as an ambitious blueprint to achieve a more sustainable future for shaping national policies to combine socio-economic demands with environmental protection. Among the 17 goals and 169 targets monitoring through 244 indicators, we focused on the 9th and 11th because they are the most closely related to the urban context. The first one aims to 'build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation' to confirm that the city is a living complex of ecosystems balanced on tangible and intangible networks. The second one proposes to 'make cities and human settlements inclusive, safe, resilient and sustainable'. Particularly, the specific target 11.8 calls for a substantial increase in the number of cities implementing adaptive urban policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change (UN, 2015).

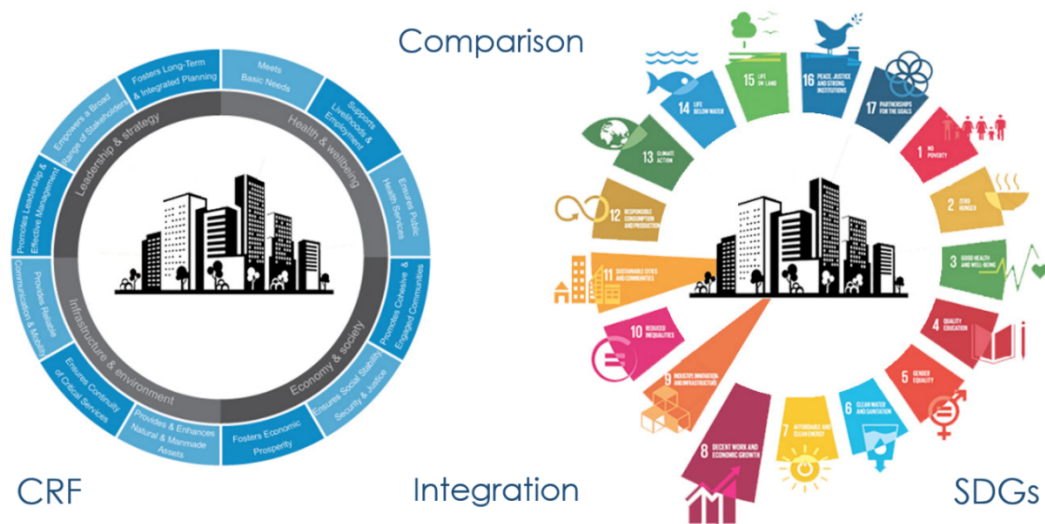


Figure 1. Applied method graphics.

## Results and Discussions

Comparison of the two indicators frameworks gives an indication of two-way synergies and divergences. It is remarkable that the terms ‘resilience’ and ‘sustainability’ are explicitly mentioned in both of them: against separatist literary trends, once again we find two concepts joint among the relevant categories. Instead, the word does not appear in either, but the CRF 7 qualities are perfectly suited to a living organism. The SDGs provide strategies at three progressive levels: built environment; green and cultural environment; and their connection by transport systems. Although we have advanced architectural techniques, there is a lack of indicators to support developing countries in upgrading slums and constructing adequate, sustainable and resilient buildings. Despite this, the CRF shares many commonalities with the SDGs: they pay special attention to people’s health and security (vulnerable situations, disaster death, economic loss, environmental impact); common identity (cultural and natural legacy); resources and land consumption; basic services (mobility, ICT); management and inter-sectoral/disciplinary approach to policy decisions responding to population and territorial dynamics. Indeed, long-term and integrated urban plans are the main instruments that cities use to regulate urban growth and development, guiding future investments as well as the interactions and trade-offs between the environment and economy. Both hold that the planning process requires ongoing monitoring of urban trends, coordination at all scales and stages of different projects across a city, a paradigm shift towards new environmentally conscious (climate change, risk reduction strategies) and inclusion through the direct participation of residents in urban programmes. Merging drivers from CRF and targets from SDGs, we can summarise them into a unique framework built on the three dimensions of sustainability: *Society, Economy and Environment* sharing a fundamental prerogative of resilience, *Strategy* (4th CRF dimension) that is how anthropogenic and natural systems prevent breakdown and timely take action to protect city together with citizen from real or future risks (Figures 2-3).

Finally, how we can translate such principles within Urban Morphology? We define the reciprocal relationship between urban form, resilience and sustainability through a set of complementary qualities that orients

contemporary urbanisation at the territorial and building scale. According to theories by Muratori and Caniggia and the abovementioned 4 *Dimensions* of urbanity, city evolution has to comply with the *organic* growth model in terms of:

a) *Morphological process*: gradual and multiscale geographical expansion (urban, peri-urban, rural areas), land recycling and gentrification, multidimensional (society, economy, environment) development and urban metabolism, autonomy and connectivity (access to mobility), reciprocity between different functional parts and the whole, participatory processes (equity and inclusion);

b) *Typological process*: progressive evolution of building types (extensive or nature-based solutions), densification, flexible spatial configurations, integrated ICT, reuse/upgrading of existing built environment.

These specific properties guarantee that cities are reflective of past experience and resourceful in the face of future uncertainty. Resilience and sustainability are underpinned by a “shifting relationship between scales, and between autonomy on the one hand and connectivity on the other” (Allan and Bryant, 2011:43).

**City Resilience Framework (CRF):**  
an innovative approach at the global scale

4 Dimensions

PEOPLE, PLACE, ORGANISATION, KNOWLEDGE

12 Drivers/Goals

7 Qualities/Prerequisites

REFLECTIVENESS, RESOURCEFULNESS, ROBUSTNESS, REDUNDANCY, FLEXIBILITY, INCLUSIVENESS, INTEGRATION

2 Global Cooperation

100 RESILIENT CITIES  
ASIAN CITIES CLIMATE CHANGE RESILIENCE NETWORK

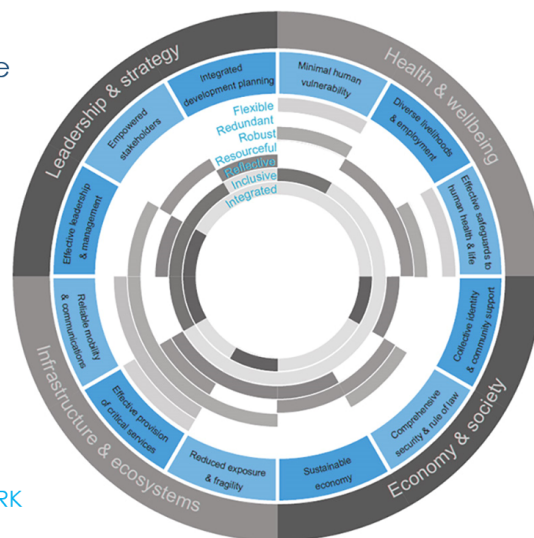


Figure 2. Key principles of City Resilience Framework.

**SDGs 9/11: Target & Indicators**

**GOAL 9 - Infrastructure**

Targets	Indicators
 9.1 Develop quality, reliable, SUSTAINABLE and RESILIENT INFRASTRUCTURE	9.1.1 Proportion of the rural population 9.1.2 Passenger and freight volumes
 9.4 UPGRADE INFRASTRUCTURE to make them sustainable	9.4.1 CO2 emission
 9.a Facilitate SUSTAINABLE AND RESILIENT INFRASTRUCTURE development in developing countries	9.a.1 Total official international support to infrastructure access
 9.b Support DOMESTIC TECHNOLOGY development, research and innovation in developing countries	9.b.1 Proportion of medium and high-tech industry value added
 9.c Significantly increase access to INFORMATION and COMMUNICATIONS TECHNOLOGY	9.c.1 Proportion of population covered by a mobile network

**GOAL 11 - Cities & Human settlements**

Targets	Indicators
 11.1 Access to adequate, safe and affordable HOUSING and BASIC SERVICES and upgrade slums	11.1.1 Proportion of the population living in slums
 11.2 Access to safe, affordable, accessible and SUSTAINABLE TRANSPORT SYSTEMS	11.2.1 Proportion of the population accessing to public transport
 11.3 Inclusive and SUSTAINABLE URBANIZATION and capacity for PARTICIPATORY	11.3.1 Ratio of land consumption 11.3.2 Direct participation of civil society in urban planning
 11.4 Protect and safeguard the world's CULTURAL and NATURAL HERITAGE	11.4.1 Preservation, protection and conservation of all cultural and natural heritage
 11.5 Protect the poor and people in VULNERABLE SITUATIONS	11.5.1 Disaster death 11.5.2 Economic loss
 11.6 Reduce the adverse ENVIRONMENTAL IMPACT OF CITIES	11.6.1 Waste control and management 11.6.2 Levels of fine particulate
 11.7 Access to safe, inclusive and accessible, GREEN and PUBLIC SPACES	11.7.1 Open and public space
 11.a Support positive links between URBAN, PERI-URBAN and RURAL AREAS	11.a.1 Policies or plans responding to population and territorial dynamics
 11.b POLICIES and PLANS for inclusion, mitigation/adaptation to CLIMATE CHANGE, RESILIENCE TO DISASTERS	11.b.1 Urban disaster risk reduction strategies 11.b.2 Natural disaster risk reduction strategies
 11.c Support developing countries in BUILDING SUSTAINABLE AND RESILIENT BUILDINGS	11.c.1 No indicator is currently listed

**Figure 3.** Key principles of SDGs.

## Conclusions

In an uncontrolled and ever-growing urbanisation trend all over the world, there is a need to promote efficient and responsible management of the expansion of our cities, with the aim of mitigating the social, economic and environmental impact that derives from this development. In order to answer the research questions, this study highlights the relevance of putting resilience and sustainability not just at the core of the global urban Agenda but at local urban planning in a complementary non-exclusive way. Like any other living organism, the city resists and survives by adapting its form to changing needs in full compliance with its own gradual evolution in structure, form and function. Thinking about the city as a living organism ensures permanence in place and continuity over time. Through their typically unitary, progressive and inter-scalar vision, Urban Morphology and Typology have an essential task in driving policy and practice towards a more organic approach to city growth. Specifically, their factual contribution in planning prosperity lay in conceiving the city as an organism, ensuring natural and cyclical urban evolution, meeting the requirements of resilience and sustainability at different scales and dimensions, safeguarding life in urban eco-systems. However, it is necessary to cross the line of the individual disciplines via a broader interdisciplinary and inter-sectoral cooperation among stakeholders and ongoing programmes.

In keeping with Whitehand's suggestion at the XV ISUF Conference, this paper is ~~just~~ an attempt to inform and renew Urban Morphology in the light of contemporaneous evaluation schemes (CRF and SDGs) by showing its potential in “taking a long view” towards new possible city futures (Ünlü, 2018:164).

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